



5 Entity types
 27 Attributes
 4 Relationship types
 8 cardinalities

The ERD diagrammed in the Crows Feet notation above, represent the intension of a simple database system where there are 5 entity types strongly identified by 5 unique primary keys that comprise 4 primary keys and 1 composite key amongst 26 unique attributes and related by 4 relationships constrained by 8 cardinalities.

All 5 entities are strong, i.e. not existence dependent but independently identified by their primary keys. There are 5 primary keys that comprise a single primary key for 4 entity types and and 1 composite key composed of 2 partial primary keys for the 5th entity = LINE. One primary key of LINE is a foreign key matching the primary candidate key of INVOICE. There are no alternate keys.

All relationships are binary, of degree 2. 3 of 4 relationships are one to many and one is one to one. There are 8 participation rules and 8 cardinalities = $2 + 2*2 + 2*1 = 8$ as follows:

- 2 entities have optional relationships: CUSTOMER, VENDOR, and PRODUCT.
- 2 entities each have 2 mandatory relationships: INVOICE and LINE.
- 1 entity has one mandatory and one optional relationship: PRODUCT.

The 5 entities each have between 3 and 8 attributes and between 2 and 7 unique attributes for a total 26 unique attributes held by:

CUSTOMER has 7 unique attributes
INVOICE has 2 unique attributes plus one matching a CUSTOMER attribute
LINE has 3 unique attributes plus 1 foreign key matching an INVOICE primary key

and 1 matching a PRODUCT attribute

PRODUCT has 7 unique attributes plus matching a VENDOR attribute.

VENDOR has 7 unique attributes.

There are 5 unique primary keys. 4 of 5 entities have one primary key and 1 entity, INVOICE, has a composite key: INV_NUMBER which is one of 2 composite keys for LINE.

Relationships' multiplicity will be described in participation / cardinality terms, first term describing minimum participation i.e. optionality and second term describing maximum or cardinality. I will underline cardinality. Optional or mandatory participation is indicated by the use of words can or must.

Entities, relationships, and business rules of participation and cardinalities:

Customer table:

CUSTOMER is the entity

Every CUSTOMER "can have" zero or many INVOICES

CUSTOMER has 7 attributes:

CUS_CODE is the primary key attribute

CUS_LNAME

CUS_AREACODE

CUS_INITIAL

CUS_BALANCE

CUS_PHONE

CUS_FNAME

The relationship between CUSTOMER and INVOICE is one to many.

Invoice table:

INVOICE is the entity

Every INVOICE "must have" by one and only one CUSTOMER

Every INVOICE "must have" one or many LINES

INVOICE has 3 attributes

INV_NUMBER is the primary key attribute

INV_DATE

CUS_CODE

The relationship between INVOICE and LINE is one to many.

Line table

LINE is the entity

Every LINE “must have” one and only one INVOICE

Every LINE “must have” one and only one PRODUCT

LINE has 5 attributes

INV_NUMBER is a partial primary key attribute

LINE_NUMBER is a partial primary key attribute

(Together they are a composite key.)

LINE_UNITS

P_CODE (primary key in PRODUCT) foreign?

LINE PRICE

The relationship between PRODUCT and LINE is one too many.

Product table

PRODUCT is the entity

Every PRODUCT “can have” zero or many LINES

Every PRODUCT “must have” one and only one VENDOR

PRODUCT has 8 attributes

P_CODE is the primary key attribute

P_QOH

P_DISCOUNT

V_CODE

P_PRICE

P_MIN

P_DESCRIPTION

P_INDATE

The relationship between VENDOR and PRODUCT is one to many.

Vendor table

VENDOR is the entity

Every VENDOR “can have/produce” zero or many PRODUCT

VENDOR has 7 attributes

V_CODE is the primary key attribute

V_NAME

V_CONTACT

V_PHONE

V_ORDER

V_STATE

V_AREACODE